**GANGES CHASMA: A POTENTIAL LANDING SITE.** Ruslan Kuzmin[1] and Ronald Greeley[2], [1] Vernadsky Institute, Russian Academy of Sciences, Kosygin St. 19, Moscow, 117975, GSP-1 Russia, [2] Arizona State University, Dept. of Geology, Box 871404, Tempe, AZ 85287-1404.

**General geology.** Ganges Chasma is in the NE part of the Valles Marineris system. Together with Capri Chasma, it is the source area for Simud and Tiu Valles. The formation of Ganges Chasma and similar features in Xanthe Terra is attributed to withdrawal of ground water and collapse of plateau rocks along fault systems [1-3]. The main part of Ganges Chasma cuts through younger Hesperian plains (unit $Hpl_3$) [4], interpreted to represent resurfacing of older units by low viscous lavas [5].

Some of the features attributed to catastrophic flooding in Hesperian times [4] modified the surface of the $Hpl_3$ unit (as well as units $Npl_1$ and $Npl_2$). These features could indicate fluvial erosion from the release of ground water. Carr [6] suggested that when the chasmata formed, the permafrost layer was thinner than today and that ground water flowed or seeped from the chasmata walls to form lakes. The lakes were subsequently drained by catastrophic outflow, forming channels in the Xanthe Terra region.

Remnants of the layered deposits visible in western Ganges Chasma could be paleolake sediments [7]. McKay and Nedell [8] suggested that the putative lakes could have been environments for the precipitation of carbonates. McEwen and Soderblom [9] suggested that some of the bright layers could be carbonates. Most of the layered deposits are superposed on chaotic terrain, suggesting a younger age than the outflow channels. Sediments associated with ground water could be also deposited on the floor of Ganges Chasma, along with mass-wasted and debris flow materials [6].

**Potential landing sites**. Two potential landing sites are selected for study in the eastern part of Ganges Chasma where there is a transition from the chasma depression to the channel. This part of Ganges Chasma may have served as the source area for the outflow channel, similar to that in the west where chaotic terrain is preserved. The map of Rotto and Tanaka [4] shows that the youngest floor deposits are mostly alluvium and mass-wasted material. These materials represent a wide range of rock ages, including the ancient megaregolith and highland plateau materials. Modern low albedo aeolian materials are found on the chasma floor [10].

**Ganges Chasma Site 1.** This site is located on smooth Hesperian outflow sediments [5], which are partly mantled by Amazonian-age mass-wasted and aeolian deposits [4]. Ganges Chasma cuts rocks of the plateau sequence (potentially including the underlying impact breccias from the period of early bombardment) to a depth > 2 km, and mass-wasted rocks from this sequence might be accessible for sampling at the base of the wall. The area is characterized by evidence of fluvial erosion, sapping, and outflow processes, making the site attractive for the exploration of ground water systems. Multiple landslides occur south of the site and could be accessed by a rover. The proposed site is between the landslides and the deposits from ground water outflow at the base of the chasma wall. West of the site are young aeolian deposits, some of which are dunes.

**Ganges Chasma Site 2.** This site is located a few hundred kilometers east of site 1. Multiple episodes of fluvial erosion and deposition are indicated by multiple incised channels and terraces. The rocks and soils available for sampling are similar to those at site 1, with the addition of terrace deposits and other sediments from the channels.

**Scientific rationale.** The potential landing sites in Ganges Chasma provide an excellent opportunity to maximize the scientific return of a mission because they might afford a wide range of rocks ages and possible compositions, and are accessible. Some of the materials have been modified by ancient ground water processes. Samples might also help establish the Martian time scale for the Noachian and Hesperian plateau sequence and enable calibration of impact crater statistics.

The discontinuity observed at the base of the 1 km-thick section exposed in the chasma could represent the base of the former cryosphere [11], marking differences in mechanical or chemical processes. The origin of the interchasma layered deposits is not well understood and at last 5 hypotheses have been proposed for them. Sampling these materials may constrain these ideas and shed light on the history of the chasma.

Samples from the chasma also could provide clues to ground water mineralization on Mars. For example Fanale, [11], Clifford [12], and Kuzmin and Zabalueva [13] suggested that zones of salt solutions could be present in the Martian cryosphere, which would have significant effects on the hydrological system. Finally, samples of the landslide material might address the style(s) of emplacement (dry avalanche or the wet debris flows), which would lead to better understandings of the hydrological characteristics of the Martian megaregolith.

Study of the regional geology and the potential landing sites would address: 1) the nature of wide spread resurfacing of the Noachian plateau, 2) relative ages for the initiation of outflow activity forming Shalbatana Vallis, 3) the possible relationship between water released from the Shalbatana Vallis source area and the Ganges Chasma paleolake, and 4) clues to the origin of the Ganges Chasma paleolake and the layered deposits.

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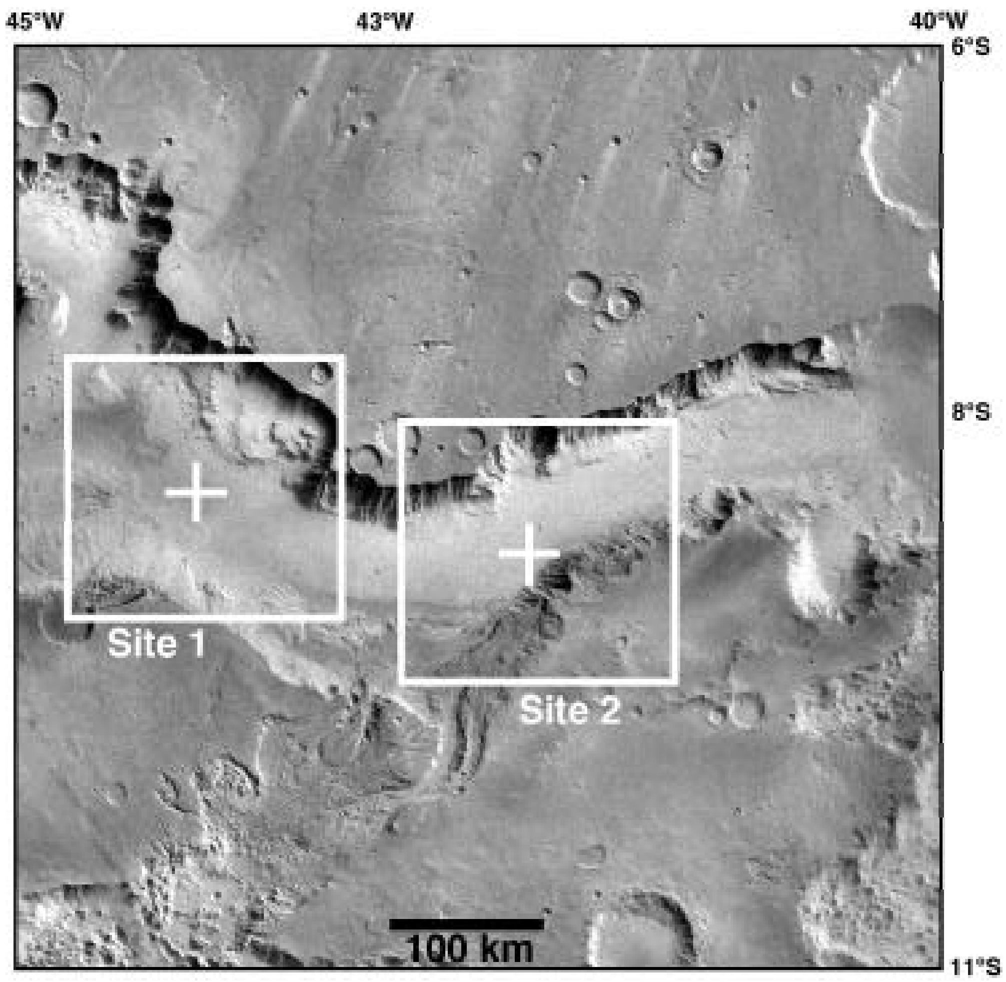


Viking Orbiter mosaic of Ganges Chasma. The landing sites are located at 8.5°S, 43.9°W, < -2 km, and 8.8°S, 42.5°, -2 km.